TRANSMITTAL OF APPEAL BRIEF (Large Entity)

Docket No.
INTL-0045-US

In Re Application Of: **Christoph E. Scheurich, Sriram Visvanathan and Oleg B. Rashkovskiy**

Serial No.	Filing Date	Examiner	Group Art Unit
09/083,601	May 22, 1998	S. An	2613

Invention: **Maintaining a Frame Rate in a Digital Imaging System**

TO THE ASSISTANT COMMISSIONER FOR PATENTS:

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed on **October 22, 2001**

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Dated: **October 29, 2001**

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Applicants:	Christoph E. Scheurich, et al.	§	Group Art Unit:	2613
Serial No.:	09/083,601	§		
		§	Examiner:	S. An
Filed:	May 22, 1998	§		
For:	Maintaining a Frame Rate in a Digital Imaging System	§	Atty. Dkt. No.:	INTL-0045-US (P5755)

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APPEAL BRIEF

Dear Sir:

Applicant hereby appeals from the Final Rejection dated September 11, 2001.

I. REAL PARTY IN INTEREST

The real party in interest is Intel Corporation, the assignee of the present application by virtue of the assignment recorded at Reel/Frame 9201/0707.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

III. STATUS OF THE CLAIMS

The application was originally filed with claims 1-18. Claims 19-24 were added during prosecution of the application. Claims 1-24 have been finally rejected and are the subject of this appeal.

Date of Deposit: 10-29-01
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IV. STATUS OF AMENDMENTS

A Supplemental Reply to Final Office Action is being filed concurrently with this Appeal Brief. The Supplemental Reply corrects a minor typographical error in claim 7. Therefore, it is assumed for purposes of this Appeal Brief that the amendment to claim 7 will be entered. All other amendments have been entered.

V. SUMMARY OF THE INVENTION

Referring to Fig. 2, an embodiment 20 of a digital imaging system in accordance with the invention includes a driver program 23 that causes a computer 22 to maintain a requested frame rate in communications between a camera 24 and the computer 22 regardless of the bandwidth that is available for the communications. In this manner, an application program 25 may, when executed by the computer 22, request a specific frame rate and a frame resolution for image data that is communicated between the camera 24 and the computer 22. If the usable bandwidth for communicating the image data does not support the requested resolution and frame rate, the driver program 23 may downwardly adjust the requested resolution to maintain the requested frame rate. In this manner, the quality (a lower resolution, for example) of the transmitted image may be traded off to maintain the requested frame rate. Specification, p. 4.

However, if the available bandwidth supports these requests, the driver program 23, in some embodiments, ensures that the requested resolution and frame rate are met. For example, the available bandwidth may be 6 megabits per second. If the application program 25 requests a resolution of 160 x 120 at 30 frames per second (fps) or a resolution of 320 x 240 at 10 fps, then the driver program 23 does not need to downwardly adjust the requested resolution (see formula on p. 2). However, if the application program 25 requests a resolution of 320 x 240 at 30 fps, the driver program 23 may cause the camera 24 to deliver frames at a lower resolution of 180 x 135 while maintaining the requested frame rate of 30 fps. Specification, p. 4.

To deliver the requested resolution to the application program 25, the driver program 23 may cause the computer 22 to upwardly scale the resolution of the received image data to achieve the requested resolution. For example, referring to the previous example, the driver program 23 might cause the computer 22 to upscale the received image data by 1 7/9 (after the

image data is received by the computer 22) to achieve the requested resolution of 320 x 240. Specification, p. 4.

The advantages of maintaining a requested frame rate may include one or more of the following: The resolution and frame rate capability of the camera and driver program may be fully supported. Dynamic bandwidth deficits may be accommodated. Execution of the application program may not be affected by the available bandwidth of a communication link between the computer and the camera. Specification, pp. 4-5.

In some embodiments, the bandwidths that are available are quanitized into discrete sizes. For example, if the bus 26 is a USB bus, one of the properties of the USB bus requires that data be communicated across the USB bus in the form of packets. In this manner, the image data may be transmitted across the bus 26 in the form of asynchronous packets, each of which may have one of several, discrete sizes. Therefore, if a bandwidth that satisfies the frame rate and resolution specifications may not be met with one current packet size, the driver program 23 downgrades to a smaller packet size. Thus, the available bandwidths may be quanitized. Specification, p. 5.

Not only may the bandwidths be quanitized, the resolutions may also be quanitized. For example, the camera 24 may only be available to scale resolutions down by a 8:1, 4:1 or 2:1 ratio, as examples. Thus, for example, if an image captured by the camera 24 has a resolution of 640 x 480, the camera 24 may only be able to furnish image data (to the bus 26) that indicates an image having a resolution of 640 x 480, 320 x 240, 160 x 120, or 80 x 60. In some embodiments, the discrete sizes available for the bandwidth and resolution are taken into account by the driver program 23. Specification, p. 5.

Because the usable bandwidth on the bus 26 may dynamically change, the driver routine 23 may be invoked automatically by the computer 22. For example, the driver program 23 may be invoked periodically by an interrupt request or may be invoked when a predetermined condition occurs. The driver program 23 may also be invoked, for example, when the application program 25 first requests the frame rate and resolution. Specification, p. 5.

Referring to Fig. 3, in some embodiments, the driver program 23 causes the computer 22 to first determine (block 35) the required bandwidth based on the requested values for the frame rate and resolution. Next, the driver program 23 causes the computer 22 to determine (block 36) the usable bandwidth of the bus 26. This step, in some embodiments, may include a series of

tests where discrete packet sizes are requested to determine the usable bandwidth. For example, the driver program 23 may cause the computer 22 to submit a request to an interface (not shown) for the bus 26 to attempt allocate a first packet size for communications across the bus 26. If the interface denies this request, then a smaller bandwidth (and packet size) is requested. This process continues until a packet size, and thus a usable bandwidth, is determined. Specification, pp. 5-6.

Once the required bandwidth is determined, the computer 22 determines (diamond 38) whether the required bandwidth exceeds the available bandwidth. If so, the computer 22 sets (block 40) the frame rate to the requested value and decreases (block 41) the resolution to a value below the requested resolution before returning from execution of the program 13. In this readjustment of the resolution, the computer 22 takes into account the scaling capabilities of the camera 24. If the required bandwidth can be accommodated, then the computer 22 sets (block 44) the frame rate and resolution equal to the requested values and returns from execution of the driver program 23. Specification, p. 6.

Referring to Fig. 4, the camera 24, in some embodiments, includes a controller 62 that interacts with a scaling unit 66 to scale the frames and a compression unit 68 to compress the size of the frame that is transmitted across the bus 26. The camera 24 may also include a bus interface 70 that interacts with the controller 62 to furnish the signals to the bus 26 that are representative of the frame. The camera 24 includes optics 60 that focus the optical image to be captured onto an array of pixel sensors 69 (a CMOS active pixel sensor array, for example) which electrically captures the image. An analog-to-digital (A/D) converter 64 receives analog signals from the sensors 69 and furnishes the signals to the scaling unit 66. The scaling unit 66 then passes the scaled image data to the compression unit 68 which compresses the image data and furnishes the data to the bus interface 70. The controller 62 interacts with the sensors 69 to control the exposure time of the sensors 69 to the image and the retrieval of data from the sensors 69. The controller 62 also receives the frame rate and resolution that is requested by the driver program 23 and interacts with the scaling unit 66 and the bus interface 70 to ensure that the requests by the program 23 are met. Specification, p. 6.

Referring to Fig. 5, in some embodiments, the computer 22 might include a microprocessor 80 which executes a copy of the driver 23 and application 25 programs which are stored in a system memory 88. In some embodiments, the microprocessor 80 interacts with the

camera 24 to communicate frames at a frame rate. Each frame indicates an image having a resolution. The driver program 23 causes the computer 22 to receive a request to set the frame rate approximately equal to a rate value and a request to set the resolution approximately equal to a first resolution value. The driver program 23 causes the computer 22 to set the frame rate approximately equal to the rate value, determine whether communication of the image data pursuant to the rate value and resolution value exceeds the available bandwidth, and based on the determination, regulate the resolution. In other embodiments, the computer system may include multiple microprocessors, and some of these microprocessors might perform the above-stated functions. Specification, pp. 6-7.

The memory 88, the microprocessor 80 and bridge/system controller circuitry 84 are all coupled to a host bus 82. The circuitry 84 also interfaces the host bus 82 to a downstream bus 99 which is coupled to an I/O controller 90, a serial bus interface 91 (to communicate with the bus 26), and a network interface card 92, as examples. The computer 10 may also have, as examples, a CD-ROM drive 100, a floppy disk drive 94 and/or a hard disk drive 96. Specification, p. 7.

VI. ISSUES

A. Can references that do not teach or suggest instructions to cause a processor to determine whether it is possible to transmit data between a camera and a computer at a requested resolution and a requested frame rate and if not, interact with the camera to transmit the data at an adjusted resolution anticipate claims 7 and 9-11 and render claims 8 and 12 obvious?

B. Can references that do not teach or suggest a computer system that includes a camera and a computer to determine whether it is possible to transmit image data at a requested resolution and frame rate and if not, interact with the camera to transmit the image data at an adjusted resolution anticipate claims 13, 15, 17 and 18 and render claims 14 and 16 obvious?

C. Can references that do not teach or suggest determining whether it is possible to transmit data at a requested resolution and a requested frame rate and if not, transmitting the data at an adjusted resolution anticipate claims 1 and 3-5 and render claims 2 and 6 obvious?

D. Can references that do not teach or suggest determining whether it is possible to transmit data that is associated with a requested image parameter at a requested frame rate and if not, adjusting the image parameter and transmitting the data anticipate claims 19 and 21-23 and render claims 20 and 24 obvious?

VII. GROUPING OF THE CLAIMS

Claims 1-6 can be grouped together; claims 7-12 can be grouped together; claims 13-18 can be grouped together; and claims 19-24 can be grouped together.

VIII. ARGUMENT

All claims should be allowed over the cited references for the reasons set forth below:

A. Can references that do not teach or suggest instructions to cause a processor to determine whether it is possible to transmit data between a camera and a computer at a requested resolution and a requested frame rate and if not, interact with the camera to transmit the data at an adjusted resolution anticipate claims 7 and 9-11 and render claims 8 and 12 obvious?

The article of claim 7 includes a processor readable storage medium that includes instructions to cause a processor to determine whether it is possible to transmit data between a camera and a computer at a requested resolution and a requested frame rate. If not, the instructions cause the processor to interact with the camera to transmit the data at an adjusted resolution.

The Examiner rejects claim 7 under 35 U.S.C. § 102(e) in view of Thro (U.S. Patent No. 6,037,991). Thro teaches a method and apparatus for communicating video information in a communication system. More particularly, Thro teaches selecting a priority between either a frame rate or a resolution per frame for the communication of frames between a mobile device and a base site. Thro, 5:4-19. Thro also discusses using a frame rate that the communication resource (over which the frames are transmitted) will support. Thro, 5:50-67.

Regarding the selection of a priority in the communication of the frames, Thro teaches that if the frame rate is selected to have priority over the resolution per frame, the frames are transmitted at a relatively high frame rate and at a relatively low resolution. Conversely, Thro teaches that if the resolution per frame is selected to have priority over the frame rate, the frames are transmitted at a relatively low frame rate and a relatively high resolution. Thro, 5:4-49.

However, Thro neither teaches (explicitly, inherently or implicitly) nor suggests transmitting data at an adjusted resolution if a determination is made that is not possible to transmit the data at a requested resolution and a requested frame rate. Although Thro discloses using a frame rate that the communication resource (over which the frames are communicated) will support (Thro, 5:57-62), Thro neither teaches nor suggest transmitting data at an adjusted resolution if a particular frame rate cannot be supported.

In this regard, the Examiner contends that the adjustment of the resolution based on a determination whether it is possible to transmit data at a requested resolution and a requested frame rate is inherent in Thro. Advisory Action, p. 1. For a limitation to be inherent in Thro, the alleged limitation must necessarily flow from the teachings of Thro. *Ex parte Levy*, 17 USPQ 2d 1461, 1464 (Bd. Pat. App. & Inter. 1990). However, this is not the case here, as there is at least another option available if the communication resource cannot support a particular frame rate: a slower frame rate may be used to transmit data without adjusting the resolution per frame. For example, if the communication resource of Thro cannot support a frame rate of 20 frames per second and a specified resolution, then a frame rate of 18 frames per second may be used, using the exact same specified resolution. Thus, adjusting a resolution based on a determination whether it is possible to transmit data between a camera and a computer at a

requested resolution and a requested frame rate does not necessarily flow from the teachings of Thro.

As such, instructions to cause a processor to make a determination whether it is possible to transmit data between a camera and a computer at a requested frame rate and a requested resolution; and if not, interact with the camera to transmit a data at an adjusted resolution are not explicitly, implicitly or inherently taught by Thro.

Therefore, the rejections of claims 7-12 should be reversed.

B. Can references that do not teach or suggest a computer system that includes a camera and a computer to determine whether it is possible to transmit image data at a requested resolution and frame rate and if not, interact with the camera to transmit the image data at an adjusted resolution anticipate claims 13, 15, 17 and 18 and render claims 14 and 16 obvious?

The computer system of claim 13 includes a communication link, a camera to communicate image data to the communication link and a computer. The computer receives the image data from the communication link, determines whether it is possible to transmit the data at a requested resolution and frame rate and if not, interacts with the camera to transmit the data at an adjusted resolution.

The Examiner relies on Thro in rejecting claim 13 under 35 U.S.C. § 102(e). However, Thro neither teaches nor suggests a computer to determine whether it is possible to transmit data at a requested resolution and frame rate and if not, interact with a camera to transmit the data at an adjusted resolution. In this manner, although Thro teaches transmitting data across a communication resource at a frame rate that the communication resource can support, Thro neither teaches nor suggests adjusting a resolution per frame if it is determined that it is not possible to transmit image data at a requested resolution and frame rate. Contrary to the Examiner's contentions, these limitations are not inherently taught by Thro, as the frame rate

may be lowered to make it possible to transmit frames across a communication resource that will not support a higher frame rate. Thus, the claim limitations do not necessarily flow from the teachings of Thro and therefore, cannot be considered to be inherent.

Thus, the rejections of claims 13-18 should be reversed.

C. Can references that do not teach or suggest determining whether it is possible to transmit data at a requested resolution and a requested frame rate and if not, transmitting the data at an adjusted resolution anticipate claims 1 and 3-5 and render claims 2 and 6 obvious?

The method of claim 1 includes determining whether it is possible to transmit data at a requested resolution and a requested frame rate. If not, the data is transmitted at an adjusted resolution.

The Examiner relies on Thro in rejecting claim 1 under 35 U.S.C. § 102(e). However, Thro does not supply all of the claim limitations, and thus, the § 102 rejection is improper. In this manner, Thro neither teaches nor suggests determining whether it is possible to transmit data at a requested resolution and a requested frame rate and if not, transmitting the data at an adjusted resolution. Furthermore, these claim limitations are not inherently taught by Thro for at least the reasons discussed above in connection with Issues A and B.

Thus, the rejections of claims 1-6 should be reversed.

D. Can references that do not teach or suggest determining whether it is possible to transmit data that is associated with a requested image parameter at a requested frame rate and if not, adjusting the image parameter and transmitting the data anticipate claims 19 and 21-23 and render claims 20 and 24 obvious?

The method of claim 19 includes determining whether it is possible to transmit data that is associated with a requested image parameter at a requested frame rate and if not, adjusting the image parameter and transmitting the data.

The Examiner relies on Thro in rejecting claim 19 under 35 U.S.C. § 102(e). However, this rejection is improper as Thro neither teaches nor suggests determining whether it is possible to transmit data that is associated with a requested image parameter at a requested frame rate and if not, adjusting the image parameter and transmitting the data. In this manner, Thro is silent as to any adjustments that are made to the frame rate or resolution in the event that the communication resource will not support a particular frame rate. The missing claim limitations are not inherent in Thro, as the frame rate (instead of an image parameter) may be adjusted to make it possible to transmit frames over the communication resource. Thus, the missing claim limitations are not inherent in Thro.

Thus, the rejections of claims 19-24 should be reversed.

IX. CONCLUSION

The Assignee requests that each of the final rejections be reversed and that the claims subject to this appeal be allowed to issue.

Respectfully submitted,

Date: 10/29/01

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APPENDIX OF CLAIMS

The claims on appeal are:

1. A method for communicating between a camera and a computer, comprising:

determining whether it is possible to transmit data at a requested resolution and a requested frame rate; and

if not, transmitting the data at an adjusted resolution.

2. The method of claim 1, wherein the adjusted resolution comprises a decreased resolution.

3. The method of claim 1, further comprising transmitting the data at the requested frame rate.

4. The method of claim 1, wherein the act of determining comprises determining an available bandwidth for communications between the camera and the computer.

5. The method of claim 4, wherein the act of determining comprises periodically evaluating the available bandwidth.

6. The method of claim 1, wherein the act of determining comprises testing for available packet sizes for transmitting the data.

7. An article comprising a processor readable storage medium including instructions that cause a processor to:

determine whether it is possible to transmit data between a camera and a computer at a requested resolution and a requested frame rate; and

if not, interact with the camera to transmit the data at an adjusted resolution.

8. The article of claim 7, wherein the adjusted resolution comprises a decreased resolution.

9. The article of claim 7, wherein the instructions to determine comprise instructions to cause the processor to transmit the data at the requested frame rate.

10. The article of claim 7, wherein the instructions to determine comprise instructions to cause the processor to determine a usable bandwidth for communications between the computer and the camera.

11. The article of claim 10, wherein the instructions to determine comprise instructions to cause the processor to periodically evaluate the available bandwidth.

12. The article of claim 7, wherein the instructions to determine comprise instructions to cause the processor to test for available packet sizes to transmit the data.

13. A computer system comprising:

a communication link;

a camera to communicate image data to the communication link; and

a computer to:

receive the image data from the communication link,

determine whether it is possible to transmit the data at a requested resolution and frame rate, and

if not, interact with the camera to transmit the data at an adjusted resolution.

14. The computer system of claim 13, wherein the adjusted resolution comprises a decreased resolution.

15. The computer system of claim 13, wherein the determination includes determining a usable bandwidth for transmissions between the camera and the computer.

16. The computer system of claim 13, wherein the determination of the usable bandwidth comprises testing for available packet sizes for transmitting the data.

17. The computer system of claim 13, wherein the computer further interacts with the computer to transmit the data at the requested frame rate.

18. The computer system of claim 13, wherein the computer further interacts with the camera to transmit the data at the requested resolution if it is possible to transmit the data at the requested resolution and the requested frame rate.

19. A method for communicating between a camera and a computer, comprising:

determining whether it is possible to transmit data that is associated with a requested image parameter at a requested frame rate; and

if not, adjusting the image parameter and transmitting the data.

20. The method of claim 19, wherein the adjusted image parameter comprises a decreased resolution.

21. The method of claim 19, further comprising transmitting data at the requested frame rate.

22. The method of claim 19, wherein the act of determining comprises determining an available bandwidth for communications between the camera and the computer.

23. The method of claim 22, wherein the act of determining comprises periodically evaluating the available bandwidth.

24. The method of claim 19, wherein the act of determining comprises testing for available packet sizes for transmitting the data.